

# A Balancing Act



Just a little perspective.....

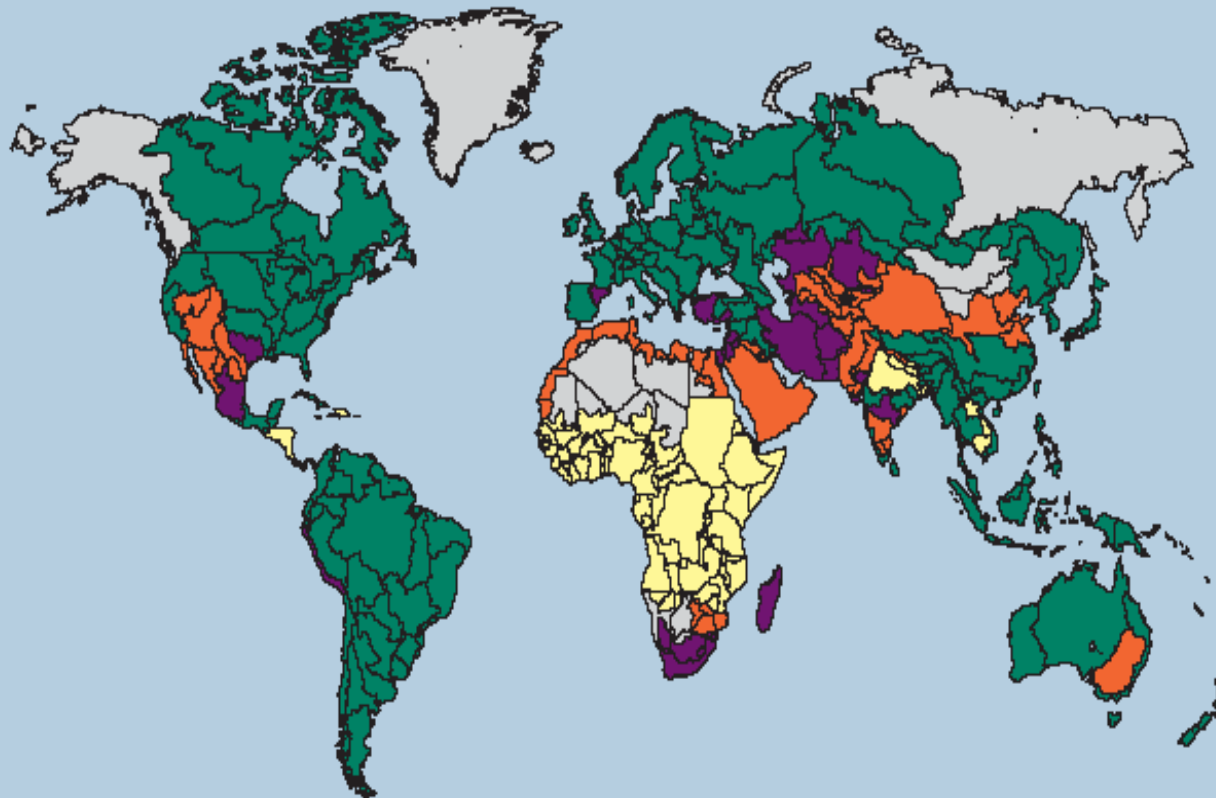


But this is home and it's beautiful-



# Although a wet planet, in some places water is not abundant – or so we think

## Areas of Physical and Economic Water Scarcity



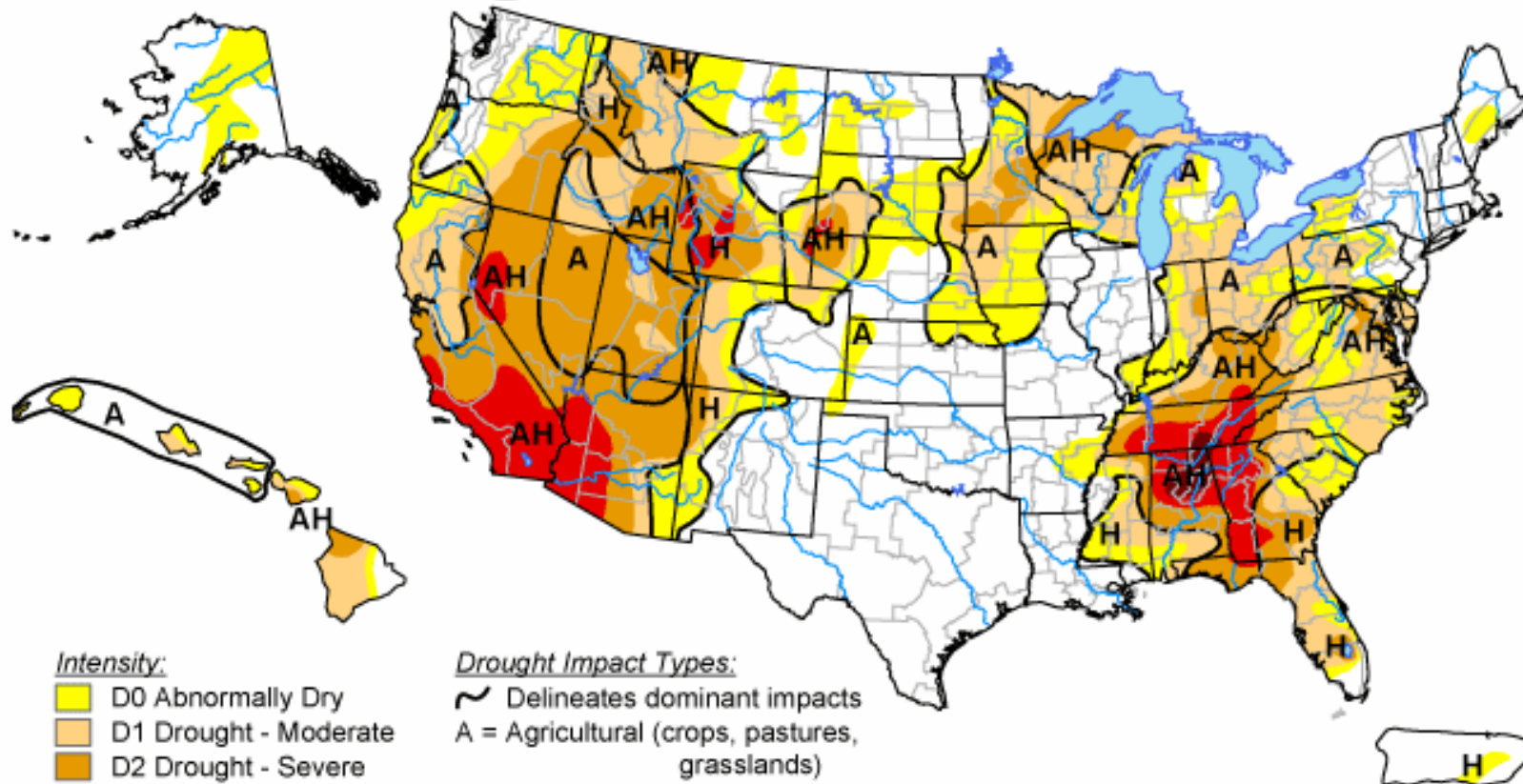
- Little or no water scarcity. Abundant water resources relative to use, with less than 25% of water from rivers withdrawn for human purposes.
- Physical water scarcity (water resources development is approaching or has exceeded sustainable limits). More than 75% of the river flows are withdrawn for agriculture, industry, and domestic purposes (accounting for recycling of return flows). This definition—relating water availability to water demand—implies that dry areas are not necessarily water scarce.
- Approaching physical water scarcity. More than 60% of river flows are withdrawn. These basins will experience physical water scarcity in the near future.
- Economic water scarcity (human, institutional, and financial capital limit access to water even though water in nature is available locally to meet human demands). Water resources are abundant relative to water use, with less than 25% of water from rivers withdrawn for human purposes, but malnutrition exists.

Physical water scarcity   Approaching physical water scarcity   Economic water scarcity   Little or no water scarcity   Not estimated

# U.S. Drought Monitor

July 24, 2007

Valid 8 a.m. EDT



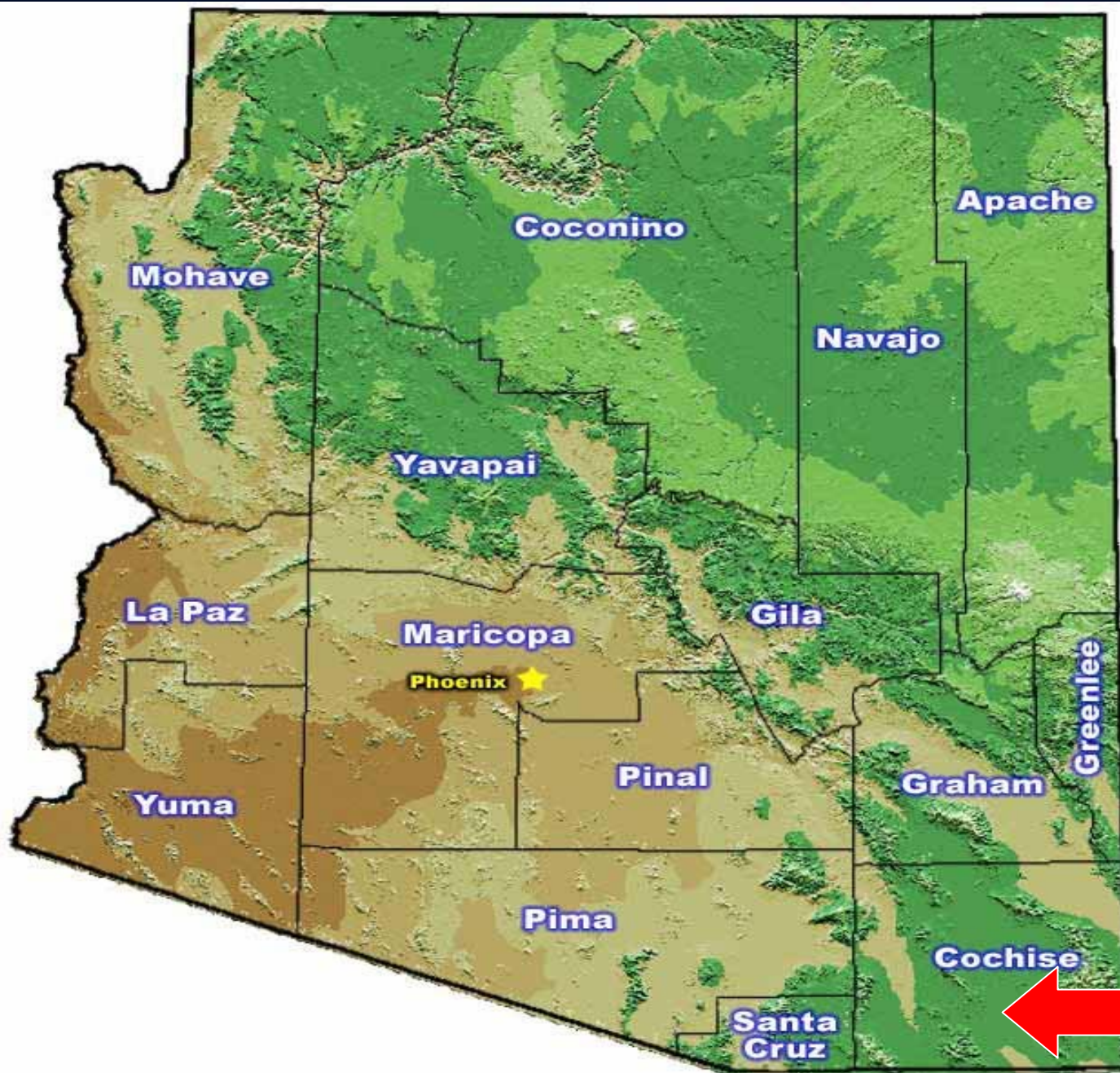
The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text summary for forecast statements.

<http://drought.unl.edu/dm>



Released Thursday, July 26, 2007

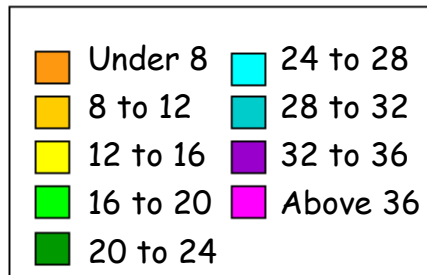
Author: Richard Heim/Liz Love-Brotak, NOAA/NESDIS/NCDC



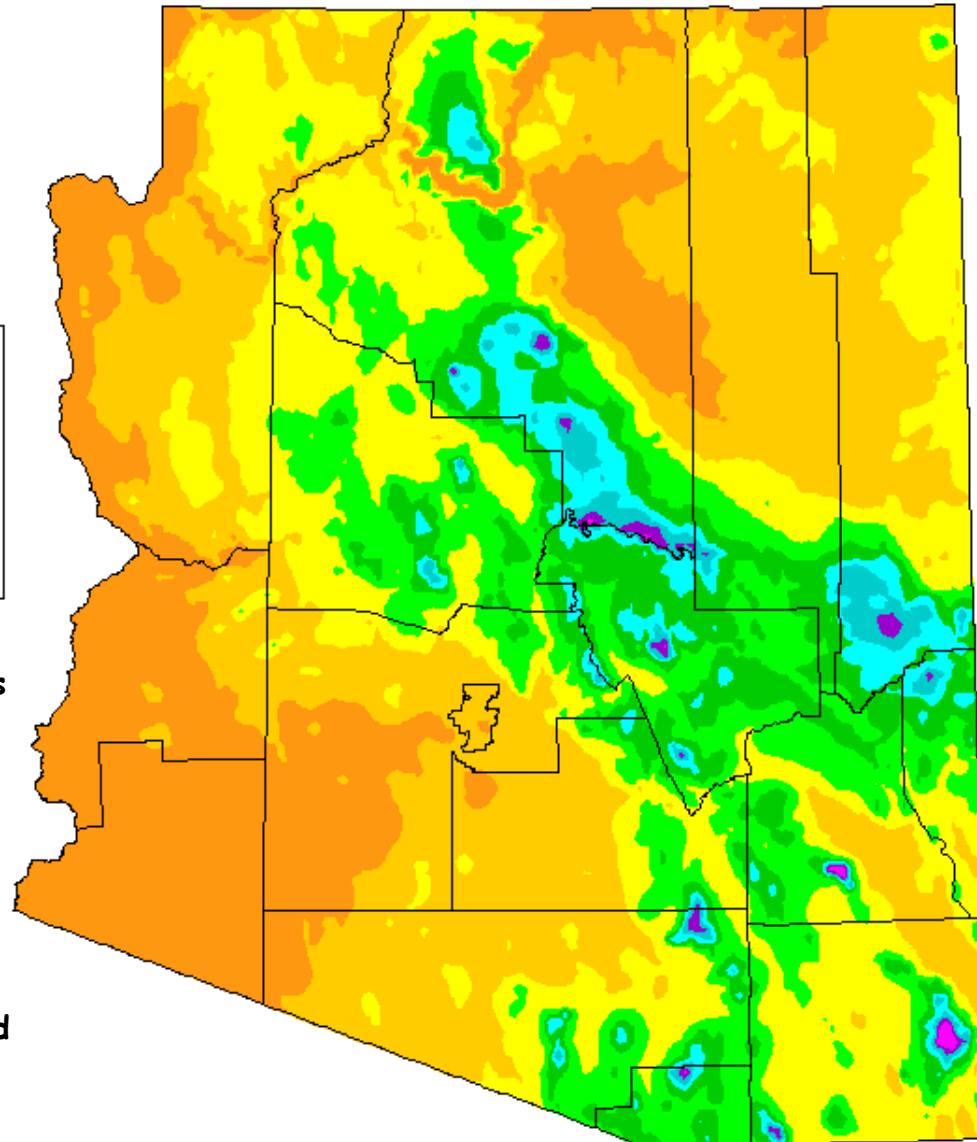
**Sierra Vista  
Subwatershed**

# Arizona Average Annual Precipitation

Oregon Climate Services  
Oregon State University



Most of Arizona receives less than 12" of rainfall per year. This makes the areas that do receive higher precipitation, such as the White Mountains, critical in generating surface water that supports streamflows and fills reservoirs



[HTTP://geography.asu.edu/azclimate/ocs/az.gig](http://geography.asu.edu/azclimate/ocs/az.gig)

# U.S. Drought Monitor

## Arizona

July 24, 2007

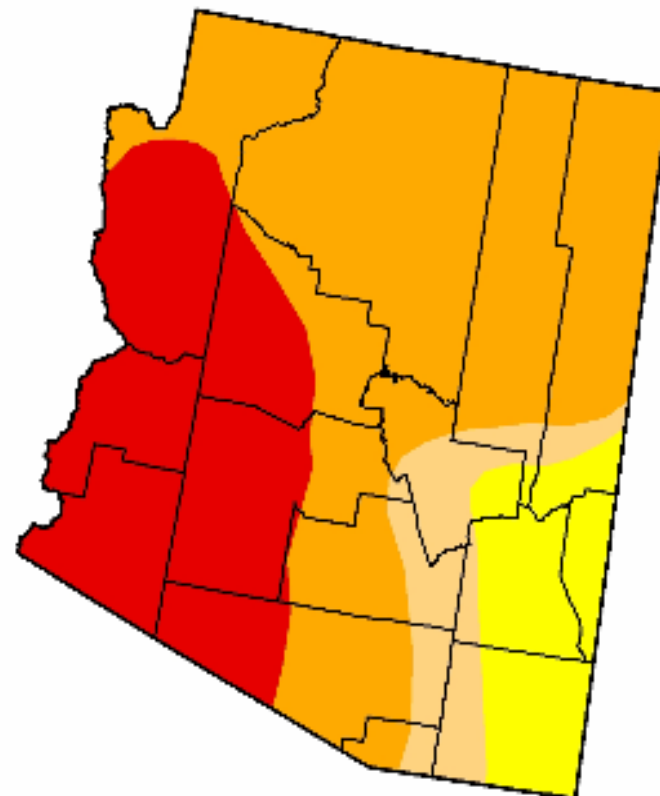
Valid 7 a.m. EST

Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	0.0	100.0	89.1	80.5	28.6	0.0
Last Week (07/17/2007 map)	0.0	100.0	89.1	74.2	28.6	0.0
3 Months Ago (05/01/2007 map)	0.0	100.0	89.5	74.2	22.0	0.0
Start of Calendar Year (01/02/2007 map)	1.0	99.0	77.3	22.7	3.0	0.0
Start of Water Year (10/03/2006 map)	5.4	94.6	75.9	28.5	7.3	0.0
One Year Ago (07/25/2006 map)	0.0	100.0	95.6	79.1	46.1	6.4

### Intensity:

 D0 Abnormally Dry	 D3 Drought - Extreme
 D1 Drought - Moderate	 D4 Drought - Exceptional
 D2 Drought - Severe	



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for forecast statements

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# San Pedro River Valley



# San Pedro Riparian National Conservation Area (SPRNCA) Federally Protected



# Problem

In the Sierra Vista Subwatershed,  
groundwater sole water source  
for people and river

- Overdraft = approximately 10,000 AFY  
(acre foot = 325,851 gallons of water)
  - 10,000 AFY by 2011
  - 26,500 AFY by 2050

History of overdraft in the urban southwest has  
dried up nearby riparian areas

# Growth in the Sierra Vista Subwatershed



# Why are people coming?



# Potential Riparian Consequence to the SPRNCA



~~River~~ = Ft. ~~Huachuca~~ = ~~Economy~~

Huachuca Water Umbel

Endangered Species



# What's Being Done



A consortium of 21 agencies and organizations working together to meet the water needs of area residents while protecting the San Pedro River.

The purpose of the Partnership is to coordinate and cooperate in the identification, prioritization and implementation of comprehensive policies and projects to assist in meeting water needs in the Sierra Vista Subwatershed of the Upper San Pedro River Basin.

# Partnership Projects

## Augmentation

- Apply for Colorado River water
- Bring water from mines to the river/community

## Groundwater Recharge

- Effluent
- Stormwater

## Conservation (many)

- Storm and Rainwater collection

# Storm and Rainwater Harvesting

The background of the slide is a solid dark blue. In the lower right quadrant, there are several stylized, wavy lines in a slightly lighter shade of blue, suggesting the movement of water or rain. These lines are curved and layered, creating a sense of flow.

# Partnership Studies

## Bureau of Reclamation Appraisal Studies

Water Recharge Potential of Collected Urban  
Runoff in the Sierra Vista Area

Water Development Potential of Rainwater  
Collection for New Residential Communities and  
New Commercial/Industrial Businesses

# Water Recharge Potential of Collected Urban Runoff in the Sierra Vista Area

- Collection and treatment of “differential” stormwater runoff from highly urbanized 8 square mile area = 1,800 acft/yr
  - Option 1: Recharge near river
  - Option 2: Recharge near areas of high pumping demand (AHI)

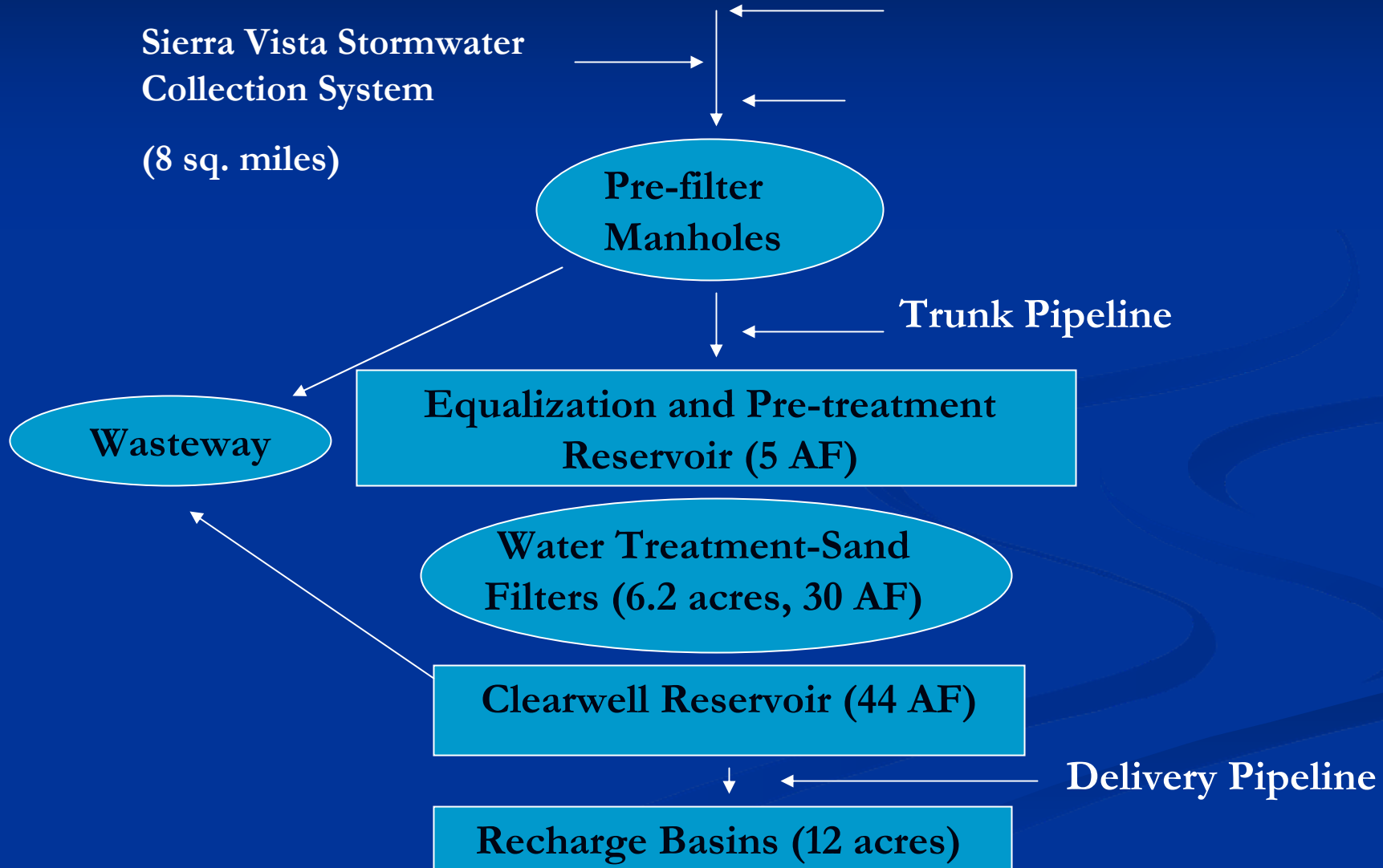
# Sierra Vista Rainfall = 14.5"/yr

- Average 60 events/year
  - 40 summer
  - 25 winter
- Only 30 storms provide collectable water (>0.2")
- Collectable water = 4.25 inches/year

# Urban Runoff Collection & Treatment System

Sierra Vista Stormwater  
Collection System

(8 sq. miles)



# Issues and Concerns

## Effectiveness

- Capturing water that may either evaporate or recharge far away from SPRNCA
- Cannot offset gw pumping during long-term drought

## Water Rights and Ownership

- Only capturing post-development runoff
- Capturing water before enters natural channel

# Issues and Concerns Cont.

## Financing

- Capital requirements = \$61 (near river)/51 million (near AHI)
- Annual operating and maintenance expenses = \$0.31/0.28M
- Total annual costs (capital cost amortized over life of project + O/M = \$4 million)
- Estimated cost \$2,675/\$2,271 AF

# Issues and Concerns cont.

Regulatory

Biological

Cultural Resources

Implementability

# Rainwater Collection Industrial/Commercial Single Building

400,000 sq ft used for analysis @ 90% efficiency

- 10 AFY yield
- 1.5 million gallons by August 1<sup>st</sup> year, 1.7+ end of year
- Would provide 271,000 gallons/month (0.8AF)

# Rainwater Collection Industrial/Commercial to 2050

**331 AFY**

(all new commercial impervious areas)

# Storm and Rain Collection Residential

## 50 home rainwater collection system

### ■ 3.6AFY

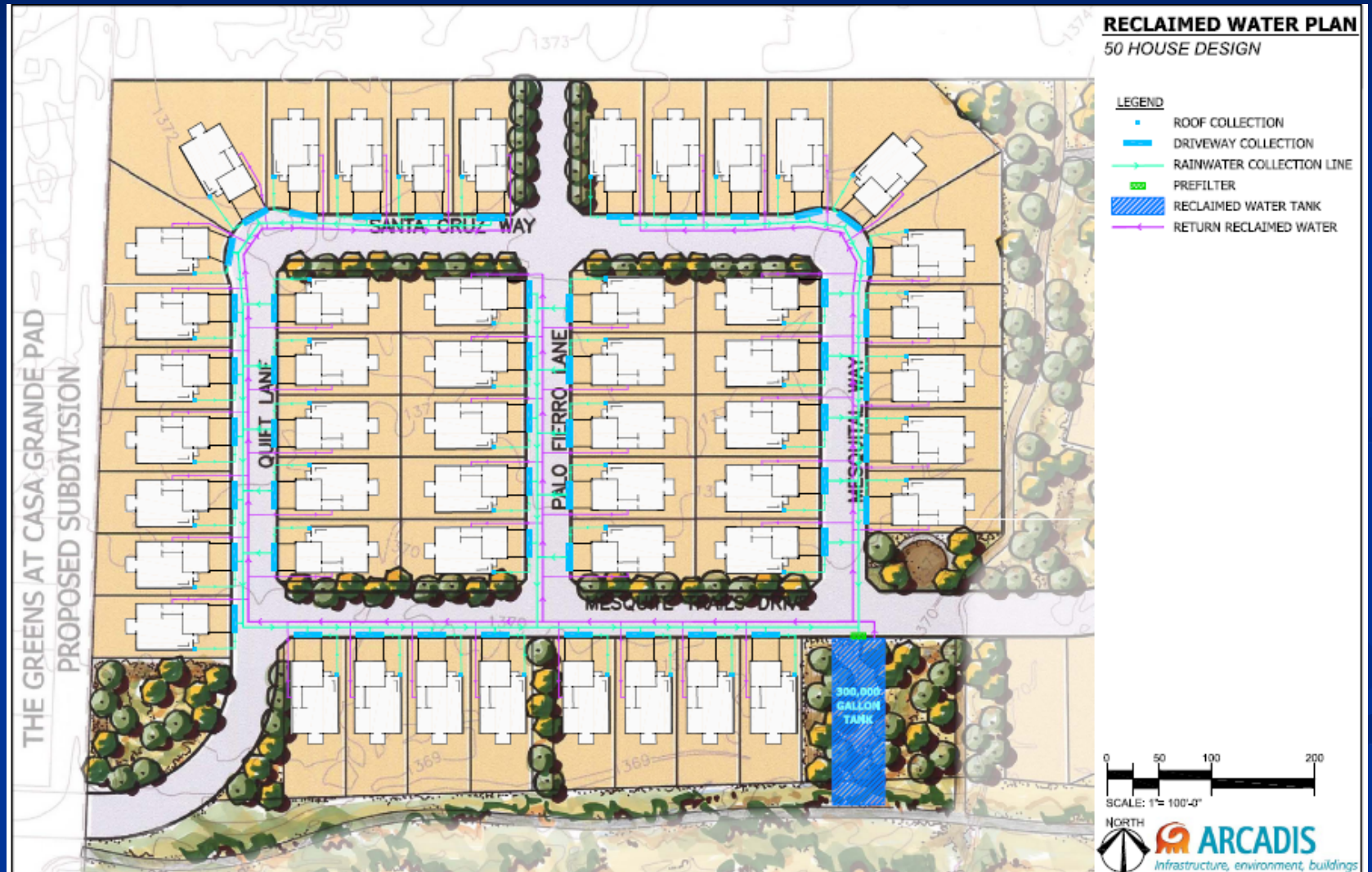
Residence: 2,000 sqft rooftop + 1,000sqft hardscape  
@ 90% rooftop and 80% hardscape (road, drive, patio)

### ■ 3.4 AFY toilet flushing

Estimated toilet use/home 14.9 gpcd or 60 gphd  
(US EPA estimate is 16.2 gpcd)

### ■ Estimated 3 years to accumulate necessary 300,000 gallon storage

# Model Subdivision



# Other Studies

Aqua Harvest – Sample study for SVS

## **Residential Master Planned Community**

- 5,400 homes on-site roof top capture
- 1,500 sqft/residence
- 15” annual rainfall
- Yield 235 AFY (38 gphd)
- Treatment: minimal, O & M minimal
- Pumping/transfer costs low because captured at source and use point
- Approx. \$3 - \$4/ gallon

# Aqua Harvest Study cont.

Residential Sample Financing

Incentive programs

- Increase densities
- Reduced impact fees
- Expedited plan reviews
- Etc.

# Commercial Sample Study

## Aqua Harvest

50,000 sqft = 1.45 AFY

Cost: \$1.75 - \$2.25/gallon

# Aqua Harvest Case Study

2004 Santa Fe County created ordinance requiring any new commercial or residential 2,500sq ft or more to have a full rain harvesting system to supply irrigation demands.

# Rancho Viejo de Santa Fe

## Master Planned Community

- First Master Planned community in U.S. to implement rwh on every home
- 120 homes
- Rancho de Viejo prior to rwh implementation water use = 0.17 AFY, after 0.12 AFY. Drop of 30% (approximately 50 gphd)
- Savings realized with 8 inches rainfall

# River Growth Economy

10,000 AFY by 2011

26,500 AFY by 2050

Choices?

# BOR Summary

- Urban Stormwater Runoff:

1,800 AFY @ \$2,675/AF (8 mi<sup>2</sup>)

- Commercial Rain/Stormwater:

331 AFY all new commercial to 2050 and/or 10 AFY (400,000 ft<sup>2</sup> building – rooftop)

- Residential Rain/Stormwater:

1,095 AFY (80% all new homes through 2050 roof and street @\$23,780/AF

# **The Shake-Out: BOR Recommendations**

## **Augmentation**

Implementation: Fair to Poor, Cost: Fair

## **Urban, Commercial and Residential Storm and Rainwater Recharge/Collection**

Implementation: Good, Cost: Poor

# Rain and Stormwater Harvesting

a good part of  
the solution  
(but let's make it  
better)

